

GE Healthcare

Health Informat Exchange Kiosk

- IHE Distributed Den
- RHIO architectures

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Originally presented at
HIMSS Conference 2006



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Health Information Exchanges – architecture primer*

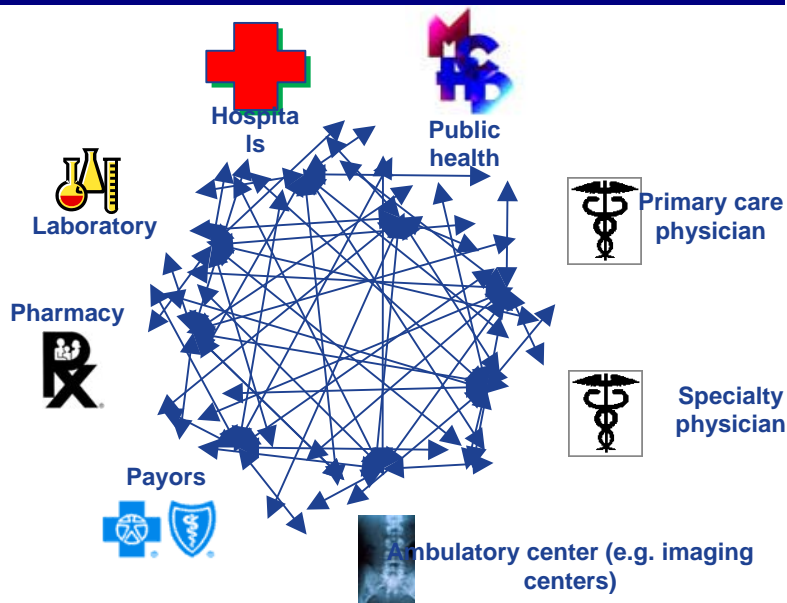
* From eHealthInitiative presentation on Health Information Exchanges



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Getting data to the correct provider: point-to-point push

Point to Point Interfaces



Description

- The laboratory maintains point-to-point connectivity to each practice
- This is current practice in the ambulatory space
- Exchange capabilities for other medical information to other providers would require additional point-to-point interfaces.

Strengths

- Accepted practice - models workflow
- Minimal process and operational changes
- Vendors are experienced with connectivity via this option



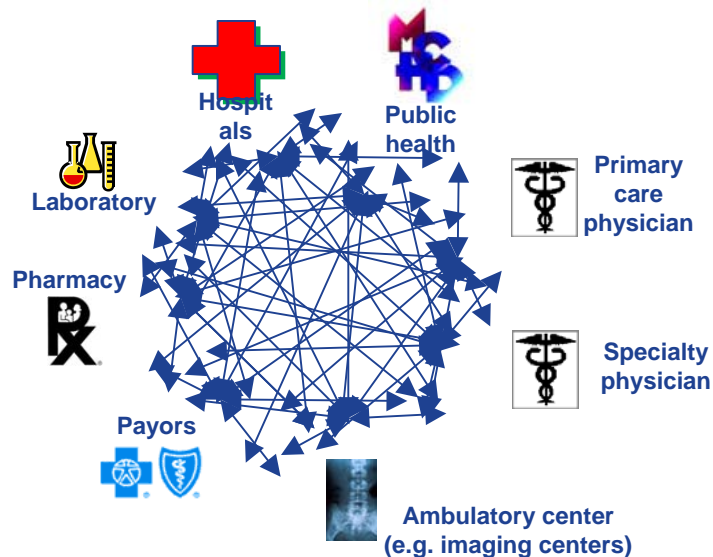
Challenges

- As currently designed:
 - ✓ Expensive for vendors/laboratories
 - ✓ Does not scale well
 - ✓ High cost of participation for small offices
- Keeps data landlocked (not readily available to other practices/providers)



Getting Data to the Correct Provider: Point-to-Point Pull (Query)

Query Model



Description

- The laboratory results reside in a laboratory database or databases
- When the EHR needs them, the EHR queries the HIE or the laboratory system and the results are returned
- The big difference is that rather than accepting unsolicited results messages, the EHR formulates a query and receives solicited messages

Strengths

- Proactive rather than reactive
- Real-time data from disparate practices available at point-of-care

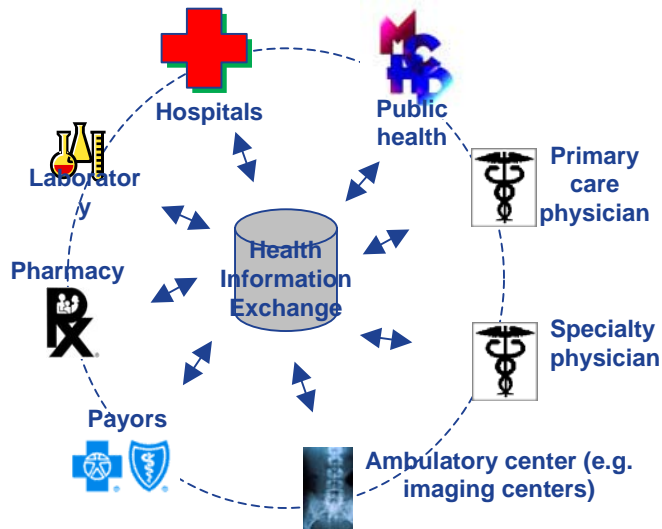
Challenges

- Labs do not currently maintain extensive historical data
- Practice and/or EHR do not know where to send queries
- Labs have an obligation to deliver the result to the ordering clinician anyway



Getting Data to the Correct Provider: HIE Push

Health Information Exchange Model



Description

- The laboratory sends the result to the HIE
- The HIE uses the provider or order information to route the result to the right practice/provider maintaining these mappings for their "local" physicians once (rather than at each data source)

Strengths

- May be most efficient long-term solution for results management

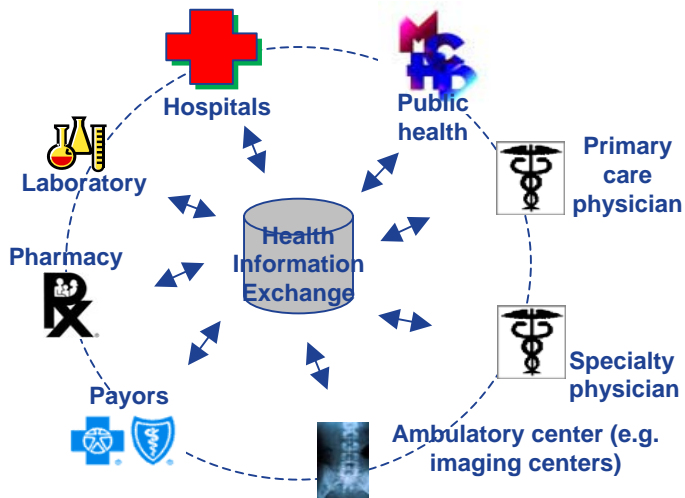
Challenges

- Who pays costs of maintaining the HIE
- Assuring security, confidentiality, privacy
- May change / challenge current ordering↔results workflow, duty
- Have abnormal results escalation notification?



Getting Data to the Correct Provider: HIE Pull (Query)

Health Data Exchange Internet Model



Description

- The provider/practice queries the HIE for the actual results when needed
- The HIE looks up the patient and queries the various sources for data and returns it to the practice

Challenges

- Who pays costs of building & maintaining?
- When systems are down, linked data unavailable
- Security, confidentiality, privacy, data ownership issues
- Community focused - limiting scope
- May change / challenge current ordering ↔ results workflow
- Liability issues for abnormal results escalation notification
- Data sources do not currently maintain data on-line long term

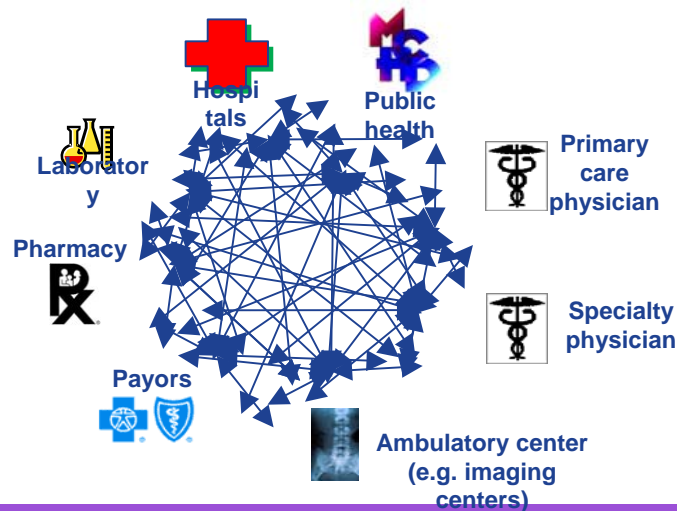
Strengths

- Efficient solution for results management in a disparate, fragmented health care system
- Efficient community-wide model (care providers have access on need-to-know basis)
- Simplifies transition and connectivity in creating a real-time ACPOE environment
- Efficient model for research and reporting



Getting All Data About The Patient Internet/Repository

Internet Model



Strengths

- Data uniformly retrievable from disparate sources
- No cost infrastructure
- Standards exist - simplest option
- Infinitely scalable
- Solves problem of data impermanence



Description

- The laboratory results reside in laboratory databases, repositories, and practices
- When the provider needs them, the EHR queries its own database, the repository, and the laboratory system and the results are returned

Challenges

- Status quo in health care & lab reporting is for proprietary messaging & proprietary connections
- Security, confidentiality, privacy & data ownership issues
- Practice/EHR not sure where all the sources of data are
- Disparate data reconciliation
- Does not solve abnormal results reporting and current practice of lab-practice results reporting

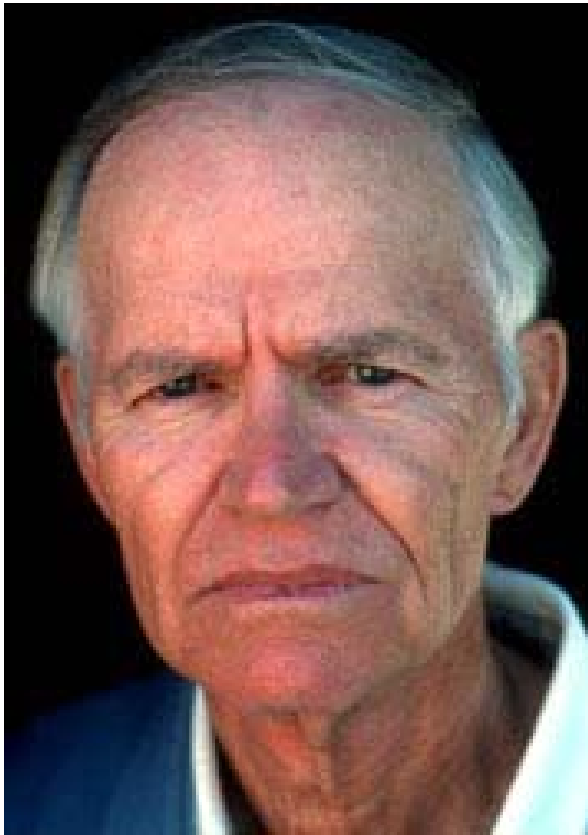


RHIO Demonstration - Using Integrating the Healthcare Enterprise (IHE) Profiles



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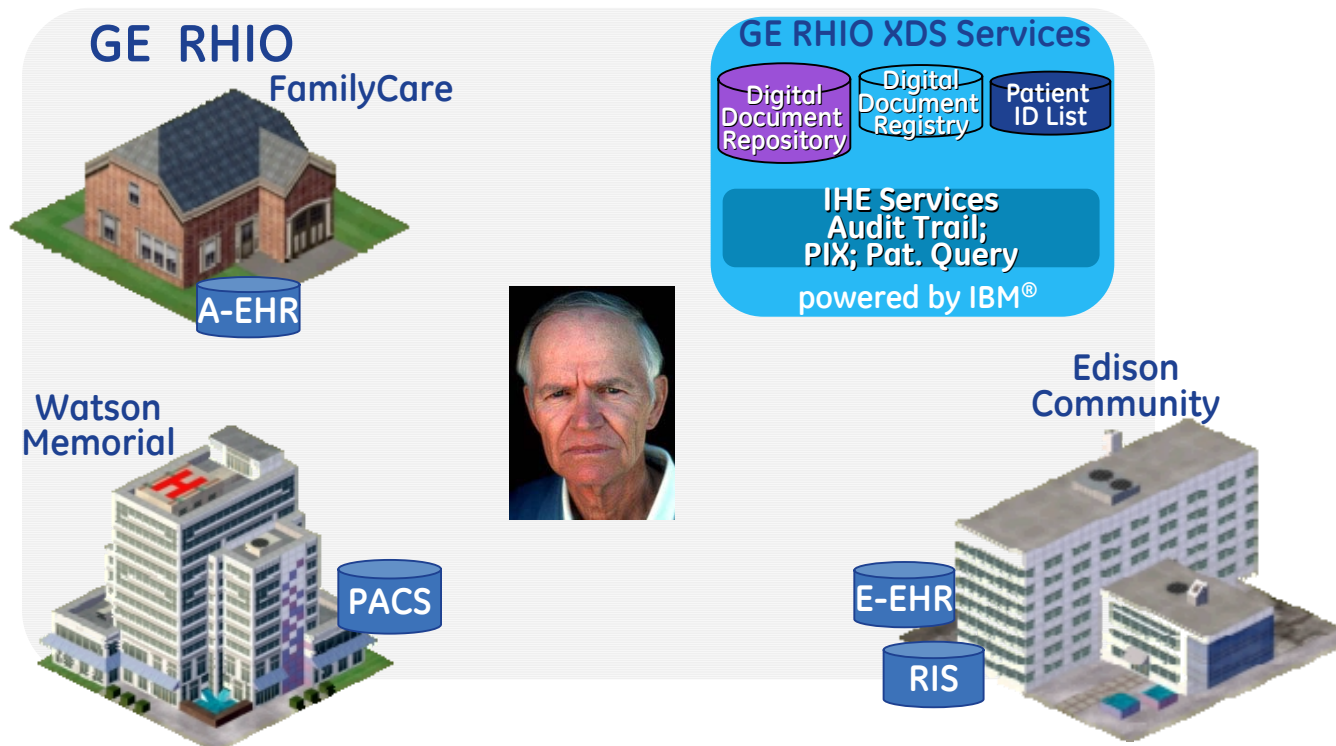
Peter Kapp is glad he lives in a Digitally Connected Community... Here's why.



- 62 year-old male
- Recently moved... seeing new physician for the first time
- Complaining of chest pain... has had three episodes in last 24 hours



Peter's physician is part of a RHIO



Accountability

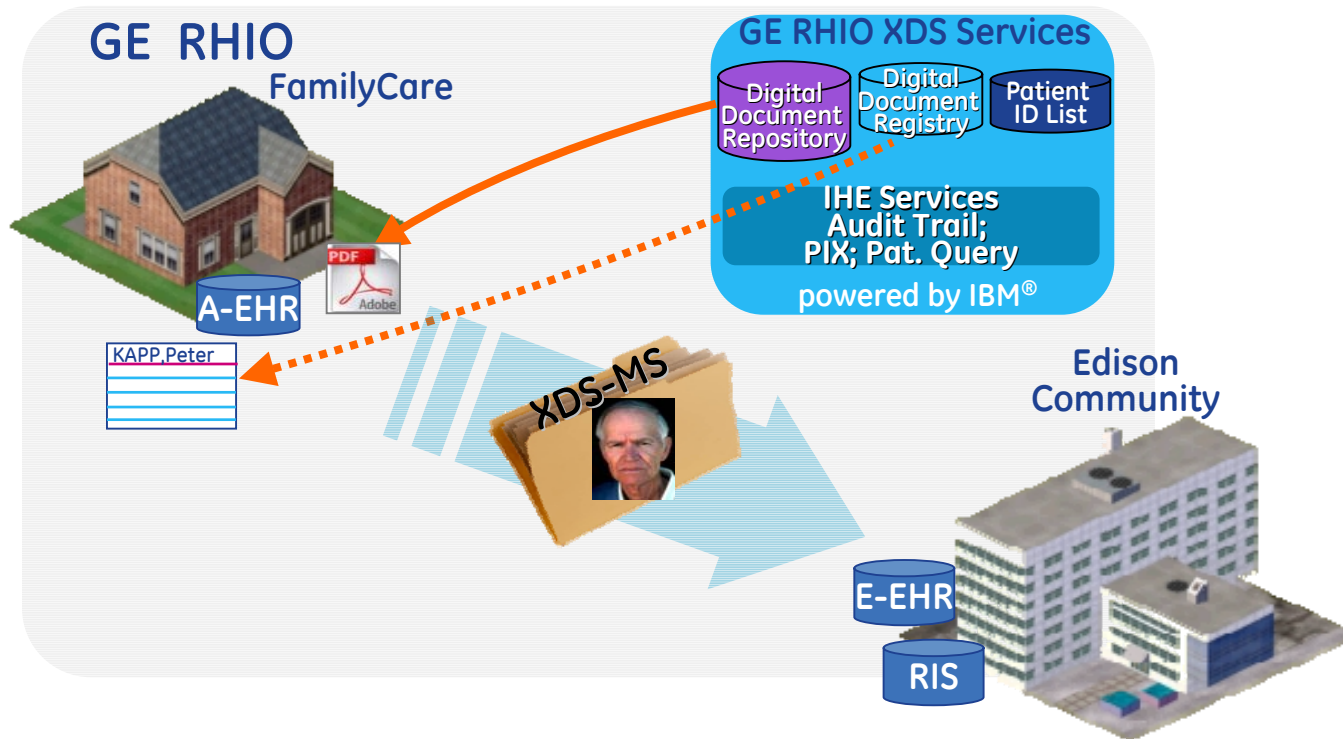
- Centralized Audit Correlation
- Highly structured Audit Logging
- Encryption and Integrity protections
- System-to-System Authentication
- Local User Authentication
- Local Access Controls

All RHIO providers are part of a secure, federated community, where:

- The RHIO keeps a registry that:
 - “points” to where patient information is located...but **not** the clinical content.
 - ensures reconciliation of patient identifiers
- Most healthcare information remains locally, where it is created.
- All RHIO members adhere to common policies governing security/privacy



Peter's "connected" medical exam



Peter's medical information available to authorized providers in the RHIO

- FamilyCare primary care physician examines Peter; performs an EKG
- From Peter's history, the physician queries the registry for relevant clinical data.
- Physician selects a previous EKG of Peter's and compares it to the latest EKG.
- Physician refers him to Edison Community for a detailed cardiac work-up, and sends a referral with detailed clinical medical summary information



Seamless medical summary exchange

1 Build Referral Medical Summary "Digital Document"

EMR gathers required clinical data from Peter's chart.

Clinician adds reason for the referral.

2 Submit Referral Document

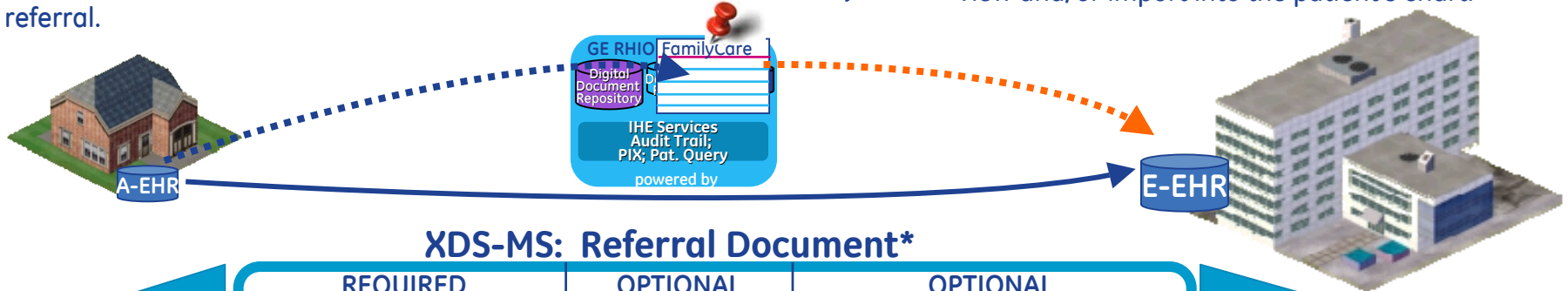
Medical summary location is submitted to RHIO registry.

Medical summary stays in EMR or other secure RHIO repository

3 Retrieve referral for review or import

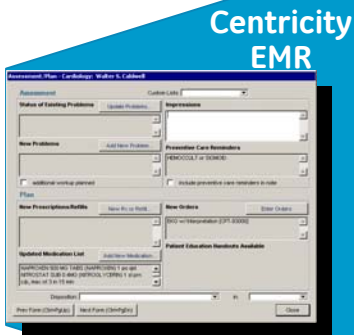
EHR queries GE RHIO registry automatically for Peter's Referral Medical Summary.

Clinician selects the referral document to view and/or import into the patient's chart.



XDS-MS: Referral Document*

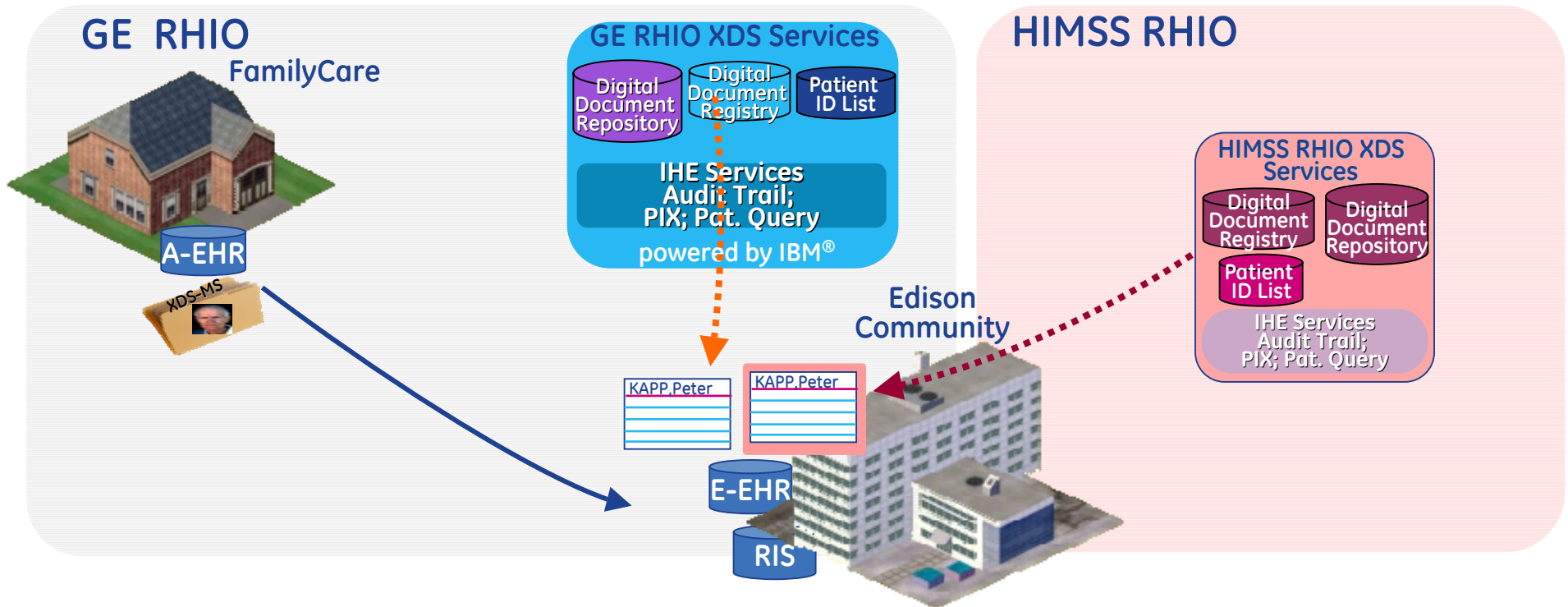
REQUIRED	OPTIONAL	OPTIONAL
Reason for Referral	Family History	Physical Exam
History of Present Illness	Social History	Vital Signs
Active Problems*	Immunizations	Relevant Diag. Tests & Reports
Current Meds*	Plan of Care	Relevant Surgical Procedures/Clinical Reports
Allergies & Other Adverse Reactions*	List of Surgeries	Advance Directives
*Requires more formal and coded structure	Review of Systems	Resolved Problems



* IHE XDS-MS based on HL7 Clinical Document Architecture (CDA) r2 / Care Record Summary Implementation Guide. HL7 CDA/CRS & ASTM Continuity of Care Record (CCR) converging to new Continuity of Care Document (CCD) in '07



Edison Memorial is *really* connected...



Peter arrives at Edison w/ his FamilyCare referral summary already there

- Admitting nurse registers Peter and loads the FamilyCare referral
- ER physician reads the referral and selects information to add to Peter's chart
- ER physician looks for other potential cardiac clinical information in the HIMSS RHIO... which has information for the community where Peter previously lived
- An angio CT is negative; and Peter is discharged after an over-night stay



Discharge summary sent to FamilyCare

① Build Discharge Medical Summary "Digital Document"

Edison's EHR gathers required clinical information from the patient's chart upon discharge.

② Submit Discharge Document

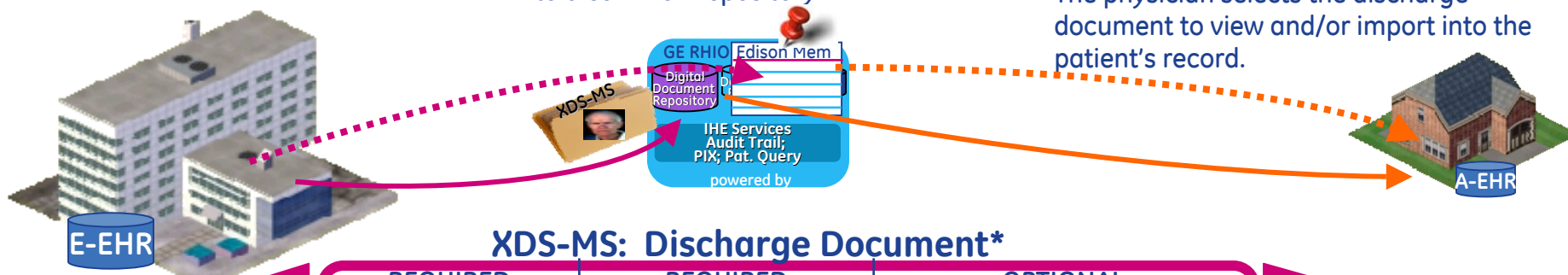
Discharge Medical Summary location is submitted to RHIO registry.

Discharge document is sent securely to a common repository.

③ Retrieve Discharge Document for review

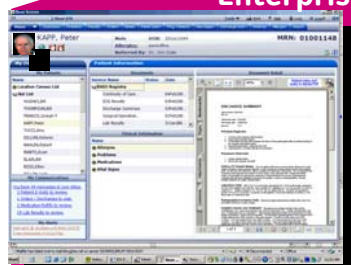
FamilyCare EMR queries GE RHIO registry automatically for Peter's Discharge Medical Summary.

The physician selects the discharge document to view and/or import into the patient's record.

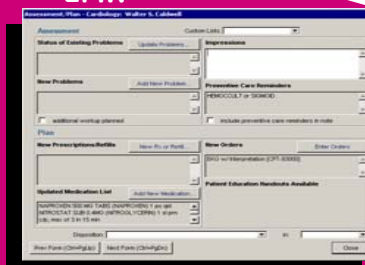


XDS-MS: Discharge Document*

REQUIRED	REQUIRED	OPTIONAL
Date of admission	Discharge Diagnosis *	History of Present Illness
Date of discharge	Discharge Meds *	Selected Meds Administered *
Participating Providers & Roles	Active and Resolved Problems *	Discharge Diet
Care Plan	Allergies and Adverse Reactions *	Review of Systems
Admission Diagnosis *	Studies and Reports (procedures and tests)	Vital Signs & Physical Findings
Hospital Course		Others



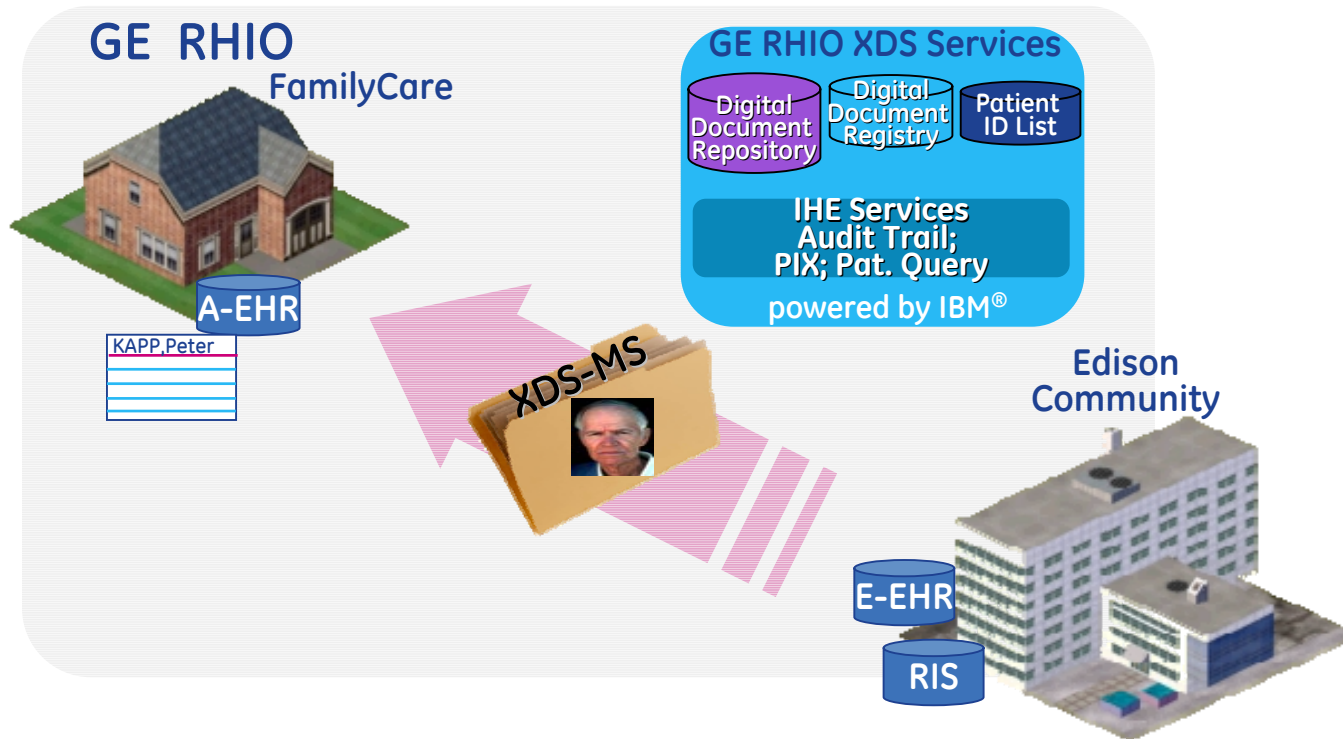
Centricity EMR



* IHE XDS-MS based on HL7 Clinical Document Architecture (CDA) r2 / Care Record Summary Implementation Guide. HL7 CDA/CRS & ASTM Continuity of Care Record (CCR) converging to new Continuity of Care Document (CCD) in '07



Accurate inpatient-outpatient exchange



Peter's physician gets detailed clinical information to guide follow-up visit

- FamilyCare retrieves Peter's Discharge Medical Summary ahead of his visit.
- Physician imports relevant continuity of care content into Peter's electronic record.
- Physician also notices Peter's CT report from Watson Memorial & reviews it as well.
- Peter is thankful that all the care-givers in his community have timely and accurate clinical information to make quality medical decisions.



IHE medical summary profiles- a primer



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Cross Enterprise Sharing of Medical Summaries (XDS-MS)

- The content of XDS-MS messages is based on the HL7 Clinical Document Architecture (CDA) and Care Record Summary (CRS) implementation guide.
- The CDA is a specification for encoding documents using XML, the HL7 Reference Information Model (RIM), HL7 Version 3 methodology, and standard vocabularies such as SNOMED and ICD.
- The CRS specifies which data elements from the CDA are necessary to include in referral and discharge summary documents.
- These standards allow progressive interoperability at multiple levels of complexity so that very simple documents as well as more complex structured, coded data can be exchanged.



Progressive interoperability w/ HL7 CDA

- A CDA document can be structured with different levels of complexity.
- Focused, coded sections of a document may contain: a) Free text, or b) Highly structured & coded text.
- With CDA's inherent scalability & flexibility, highly structured elements can still be interpreted by a receiving system that utilizes less structure, at the simpler level it understands.

```
<component1>
  <section>
    <code code="X-RFR" codeSystem="2.16.840.1.113883.6.1"/>
    <title>Reason for Referral</title>
    <text>
      <table>
        <tbody>
          <tr>
            <td>Osteoarthritis in the right knee</td>
          </tr>
        </tbody>
      </table>
    </text>
  </section>
</component1>
```

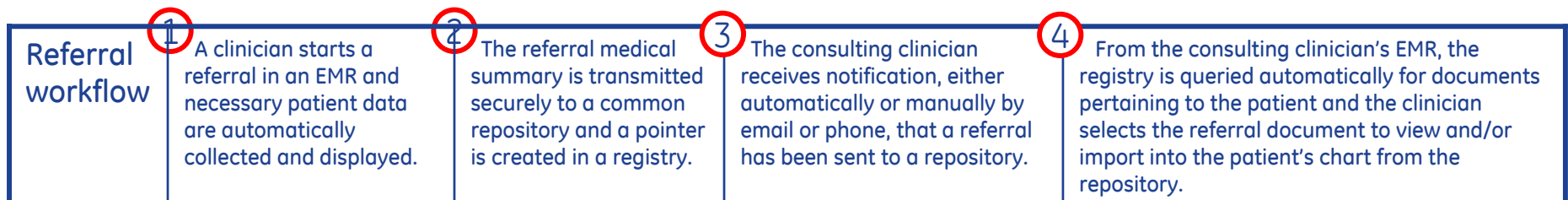
```
<component2>
  <contextConductionInd value="TRUE"/>
  <Observation classCode="COND">
    <code code="G-1001" codeSystem="SNOMED" displayName="Prior dx"/>
    <value code="D1-201A8" codeSystem="SNOMED" displayName="Osteoarthritis">
      <originalText><reference value="#a3"/></originalText>
    </value>
    <targetSiteCode code="T-15720" codeSystem="SNOMED" displayName="Knee joint">
      <qualifier>
        <name code="G-C220" codeSystem="SNOMED" displayName="with laterality"/>
        <value code="G-A100" codeSystem="SNOMED" displayName="right"/>
      </qualifier>
      <originalText><reference value="#a4"/></originalText>
    </targetSiteCode>
  </Observation>
</component2>
```



IHE XDS Referral Medical Summary

- A core set of data elements is required in the Referral summary document and other elements may be included if desired.

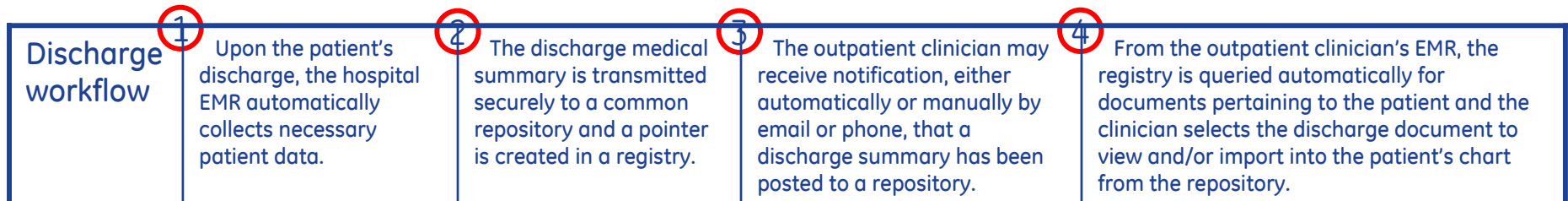
HL7 Care Record Summary Referral Clinical Data Elements	
REQUIRED	OPTIONAL
Reason for Referral	Family History
History of Present Illness	Social History
Active Problems*	Immunizations
Current Meds*	Plan of Care
Allergies and Other Adverse Reactions*	List of Surgeries
*Requires more formal and coded structure but provides more advanced data exchange and decision support capabilities.	Review of Systems
	Physical Exam
	Vital Signs
	Relevant Diagnostic Tests and Reports
	Relevant Surgical Procedures/Clinical Reports
	Advance Directives
	Resolved Problems



IHE XDS Discharge Medical Summary

- A core set of data elements is required in the Discharge summary document and other elements may be included if desired.

HL7 Care Record Summary Discharge Clinical Data Elements	
REQUIRED	OPTIONAL
Date of admission	History of Present Illness
Date of discharge	Selected Meds Administered *
Participating Providers and Roles	Discharge Diet
Care Plan	Review of Systems
Admission Diagnosis *	Vital Signs and Physical Findings
Hospital Course	Functional Status
Discharge Diagnosis *	Advance Directives
Discharge Meds *	Medications on Admission *
Active and Resolved Problems *	Vital Signs
Allergies and Adverse Reactions *	*Requires more formal and coded structure but provides more advanced data exchange and decision support capabilities.
Studies and Reports (procedures and tests)	

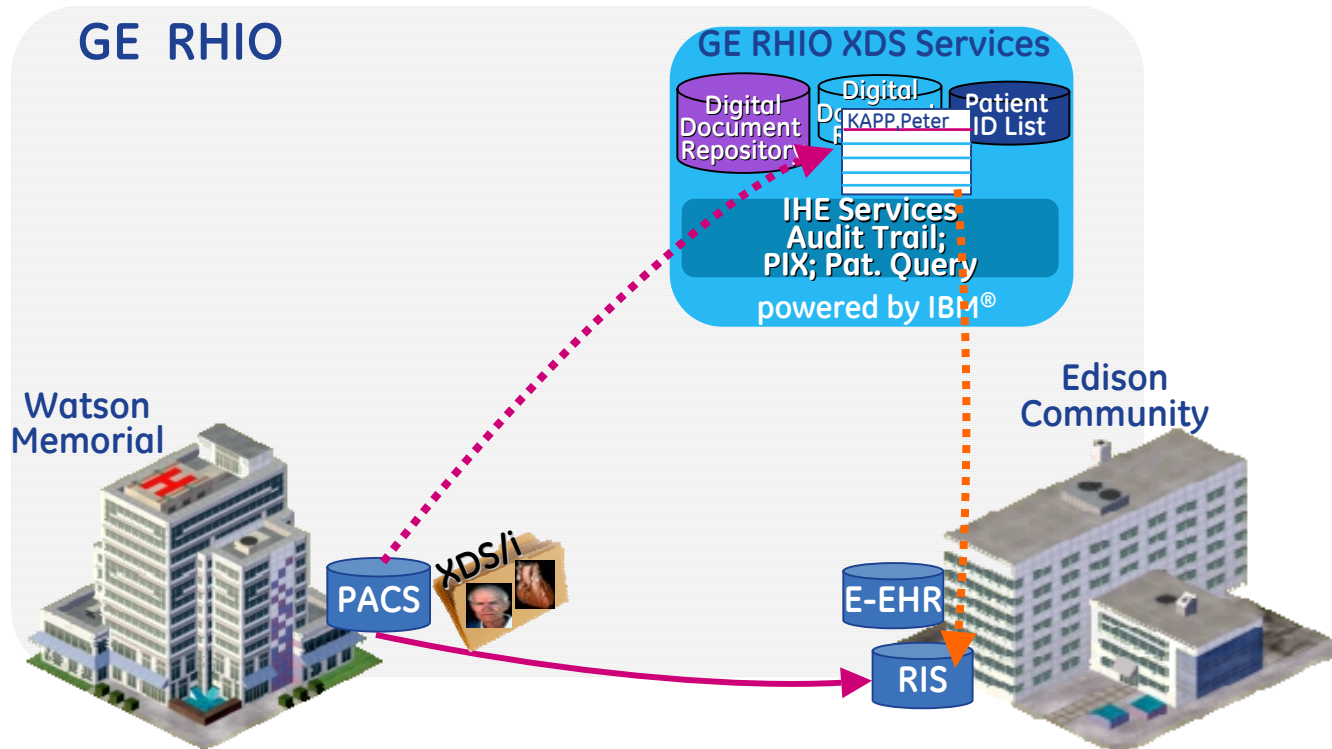


Digital Imaging Information Exchange in GE RHIO



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Better care w/ radiology info. exchange



Edison uses GE RHIO to exchange radiology data w/ Watson Memorial

- Peter needs a CT-Angio, one is ordered at Watson Memorial Hospital.
- Watson Memorial's PACS submits the radiology report & image "pointer" to GE RHIO
- Edison Radiology staff retrieves report & image information via query to GE RHIO
- Peter has 60% occlusion in proximal left coronary artery, but good collateral flow. He stays overnight, continues his nitroglycerin, & discharged the following day.



XDS/I: enabling regional DI info. sharing

1 Complete radiology exam.

Watson completes Peter's CTA.
Report and images stored in Centricity PACS in standard DICOM format.

2 Submit PACS report/image information to GE RHIO

Radiology report link sent to RHIO registry.

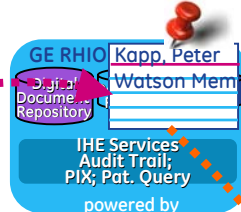
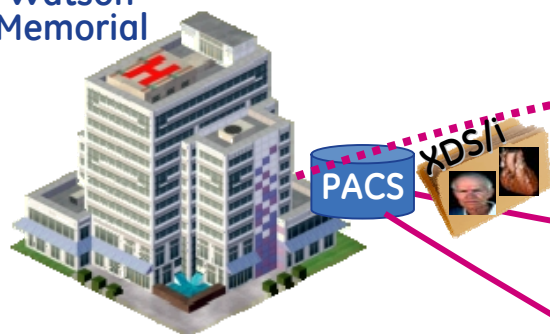
Radiology images link sent to RHIO registry. PACS is designated as a repository, and CT images remain there.

3 Retrieve for review

Edison's radiology department queries the registry and retrieves the report.

The ER physician reviews the report and views images from the GE RHIO registry link.

Watson Memorial



Edison Community



4 Community-wide access - No Waiting!

XDS allows timely access to all authorized providers.

Peter's primary care physician also has access to the CT report to review... at the same time it is made available to Edison Community.





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